

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1. (currently amended) A magnetic head including a read head structure, comprising:
2 a free magnetic layer, including a central region and outwardly disposed end regions
3 thereof; said free magnetic layer having a planar upper surface thereof that extends across said
4 central region and across each of said end regions;
5 an anti-parallel coupled magnetic layer structure being disposed directly upon said upper
6 surface of said free magnetic layer at said end regions thereof, said anti-parallel coupled
7 magnetic layer structure including at least two anti-parallel coupled magnetic layers.

1 2. (original) A magnetic head as described in claim 1 wherein a thin film nonmagnetic
2 layer is disposed between said at least two said magnetic layers.

1 3. (currently amended) A magnetic head as described in claim 1 wherein said anti-parallel
2 coupled magnetic layer structure includes a magnetic seed layer that is disposed directly upon
3 said upper surface of said free magnetic layer at said end regions of said free magnetic layer, and
4 ~~said a~~ first one of said at least two magnetic layers is disposed directly upon said seed layer.

1 4. (original) A magnetic head as described in claim 3 wherein said seed layer is formed
2 with a BCC crystal structure.

1 5. (original) A magnetic head as described in claim 4, wherein said seed layer is comprised
2 of CoFeCr, and has a thickness of from approximately 10 Å to approximately 50 Å.

1 6. (original) A magnetic head as described in claim 3 wherein a thin film nonmagnetic
2 layer is disposed on top of said first magnetic layer, and a second one of said at least two
3 magnetic layers is disposed on top of said nonmagnetic layer.

1 7. (original) A magnetic head as described in claim 6 wherein said first and second
2 magnetic layers are comprised of CoPtCr, and said first magnetic layer has a thickness that is
3 from approximately 20 Å to approximately 30 Å and said second magnetic layer has a thickness
4 of from approximately 30 Å to approximately 80 Å.

1 8. (original) A magnetic head as described in claim 7 wherein said non-magnetic layer is
2 comprised of Ru and has a thickness that is approximately 8 Å.

1 9. (original) A magnetic head as described in claim 7 wherein said seed layer has a
2 thickness, and the total thickness of said seed layer plus said first magnetic layer is greater than
3 the thickness of said second magnetic layer.

1 10. (original) A magnetic head as described in claim 1, wherein said anti-parallel coupled
2 magnetic layers have a net magnetostatic field in the same direction as a magnetic field of said
3 free layer.

1 11. (currently amended) A magnetic head as described in claim 6, wherein a third thin film
2 magnetic layer is disposed between said first magnetic layer and said nonmagnetic layer, and a

3 fourth magnetic layer is disposed between said nonmagnetic layer and a said second magnetic
4 layer.

1 12. (original) A magnetic head as described in claim 11, wherein said third magnetic layer
2 and said fourth magnetic layer are comprised of CoFe.

1 13. (currently amended) A magnetic head including a GMR sensor, comprising:
2 a plurality of thin film layers forming a GMR sensor, wherein at least one of said layers
3 is a free magnetic layer, said free magnetic layer including a planar central portion and two
4 outwardly disposed planar end regions thereof, said planar end regions being coplanar with said
5 planar central portion of said free magnetic layer;

6 a magnetic seed layer being disposed directly upon said planar end regions;

7 a first magnetic layer being disposed directly upon said seed layer;

8 a nonmagnetic layer being disposed upon said first magnetic layer;

9 a second magnetic layer being disposed upon said nonmagnetic layer;

10 wherein said first magnetic layer is formed with a magnetic field and said second
11 magnetic layer is formed with a magnetic field, and wherein the magnetic fields of said first
12 magnetic layer and said magnetic layer are anti-parallel coupled.

1 14. (original) A magnetic head as described in claim 13, wherein said free magnetic layer is
2 formed with a magnetic field in a first direction and said anti-parallel coupled magnetic field of
3 said first magnetic layer and said second magnetic layer is formed with a magnetostatic bias in
4 the same direction as the magnetic field of said free magnetic layer.

1 15. (original) A magnetic head as described in claim 13 wherein said seed layer is formed
2 with a BCC crystal structure.

1 16. (original) A magnetic head as described in claim 15 wherein said seed layer is comprised
2 of CoFeCr, and said first magnetic layer is comprised of CoPtCr, and said nonmagnetic layer is
3 comprised of Ru, and said second magnetic layer is comprised of CoPtCr.

1 17. (original) A magnetic head as described in claim 16 wherein a layer being comprised of
2 CoFe is disposed between said first magnetic layer and said nonmagnetic layer, and a second
3 layer comprised of CoFe is disposed between said nonmagnetic layer and said second magnetic
4 layer.

1 18. (currently amended) A hard disk drive including a magnetic head having a read head
2 structure, comprising:
3 a free magnetic layer, including a central region and outwardly disposed end regions
4 thereof; said free magnetic layer having a planar upper surface thereof that extends across said
5 central region and across each of said end regions;
6 an anti-parallel coupled magnetic layer structure being disposed directly upon said upper
7 surface of said free magnetic layer at said end regions thereof, said anti-parallel coupled
8 magnetic layer structure including at least two anti-parallel coupled magnetic layers.

1 19. (original) A hard disk drive as described in claim 18 wherein a thin film nonmagnetic
2 layer is disposed between said at least two magnetic layers.

1 20. (currently amended) A hard disk drive as described in claim 18 wherein said antiparallel
2 coupled magnetic layer structure includes a magnetic seed layer that is disposed directly upon
3 said upper surface of said free magnetic layer at said end regions of said free magnetic layer, and
4 said first one of said at least two magnetic layers is disposed directly upon said seed layer.

1 21. (original) A hard disk drive as described in claim 20 wherein said seed layer is formed
2 with a BCC crystal structure.

1 22. (original) A hard disk drive as described in claim 21, wherein said seed layer is
2 comprised of CoFeCr, and has a thickness of from approximately 10 Å to approximately 50 Å.

1 23. (original) A hard disk drive as described in claim 20 wherein a thin film non-magnetic
2 layer is disposed on top of said first magnetic layer, and a second one of said at least two
3 magnetic layers is disposed on top of said non-magnetic layer.

1 24. (original) A hard disk drive as described in claim 23 wherein said first and second
2 magnetic layers are comprised of CoPtCr, and wherein said first magnetic layer has a thickness
3 that is from approximately 20 Å to approximately 30 Å and said second magnetic layer has a
4 thickness that is from approximately 30 Å to approximately 80 Å.

1 25. (original) A hard disk drive as described in claim 24 wherein said non-magnetic layer is
2 comprised of Ru and has a thickness that is approximately 8 Å.

1 26. (original) A hard disk drive as described in claim 24 wherein said seed layer has a
2 thickness, and the total thickness of said seed layer plus said first magnetic layer is greater than
3 the thickness of said second magnetic layer.

1 27. (original) A hard disk drive as described in claim 18, wherein said anti-parallel coupled
2 magnetic layers have a net magnetostatic field in the same direction as a magnetic field of said
3 free layer.

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1 28. (currently amended) A hard disk drive as described in claim 23, wherein a third thin film
2 magnetic layer is disposed between said first magnetic layer and said non-magnetic layer, and a
3 fourth magnetic layer is disposed between said non-magnetic layer and a second magnetic layer.

1 29. (original) A hard disk drive as described in claim 28, wherein said third magnetic layer
2 and said fourth magnetic layer are comprised of CoFe.

1 30. (currently amended) A method for fabricating a read head structure of a magnetic head,
2 comprising the steps of:

3 fabricating a plurality of thin film layers to create a GMR sensor, said layers including a
4 free magnetic layer having a central region and outwardly disposed end regions; said free
5 magnetic layer having a planar upper surface thereof that extends across said central region and
6 across each of said end regions;

7 fabricating an anti-parallel coupled magnetic layer structure directly upon said upper
8 surface of said free magnetic layer at said end regions thereof, said anti-parallel coupled
9 magnetic layer structure including at least two magnetic layers that are anti-parallel coupled.

1 31. (currently amended) A method for fabricating a read head structure as described in claim
2 30, including the steps of:

3 fabricating a seed layer ~~on top of~~ directly upon said end portions of said free magnetic
4 layer;

5 fabricating a first said magnetic layer ~~on top of~~ directly upon said seed layer;

6 fabricating a nonmagnetic layer above said first magnetic layer; and

7 fabricating a second said magnetic layer above said nonmagnetic layer.

1 32. (original) A method for fabricating a read head structure as described in claim 31,
2 wherein a net magnetostatic field is produced by said anti-parallel coupled magnetic layers, said
3 net magnetostatic field being formed in the same direction as a magnetic field of said free
4 magnetic layer.

1 33. (original) A method for fabricating a read head structure as described in claim 31
2 wherein said seed layer is comprised of CoFeCr, said first magnetic layer is comprised of
3 CoPtCr, said nonmagnetic layer is comprised of Ru and said second magnetic layer is comprised
4 of CoPtCr.

- 1 34. (original) A method for fabricating a read head structure as described in claim 33
2 wherein said seed layer is fabricated with a BCC crystal structure.

- 3 35. (original) A method for fabricating a read head structure as described in claim 34
4 including the further steps of fabricating a layer comprised of CoFe between said first magnetic
5 layer and said nonmagnetic layer, and fabricating a second layer comprised of CoFe between
6 said nonmagnetic layer and said second magnetic layer.
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